STRUCTURAL TIMBER CONFERENCE

Copper Beech

Passivhaus Plus, Net Zero Energy

STA Awards 2025:
Winner of Winners
Timber Frame Building of the Year
Low Energy Building of the Year

Hannah Dixon
Director, Progress in Practice

Sam Bailey
Director, Bailey Projects



Introduction

The Team

Sam Bailey

Director of Bailey Projects Ltd
Main Contractor

Bailey Projects

Specialist in large residential and Passivhaus projects with 23 years experience in the construction industry

Hannah Dixon

Founder of Progress in Practice
Passivhaus designer & AECB Certifier
13 years in Passivhaus and low energy design

Progress in Practice

Architecture Studio and Passivhaus Consultants specializing in Passivhaus and low energy retrofit, without compromising on design quality

Brief

Copper Beech, Eccles



Passivhaus Design

Passivhaus was always integral to the brief and we explore options for retrofit, as well as new build using this methodology



Local Character

Our clients wanted a home that fit in well with the local area’s aesthetic



Net Zero Energy

We did not set out to deliver a Passivhaus Plus or Net Zero Energy building



Low Carbon Timber Frame

Our clients did not request a timber-frame, but came to this decision through the design journey

Design

Feasibility

- Is retrofit possible? (#scrapretrofitVAT)
- Relationship to site and context
- **Orientation, form and glazing**

Design (with PH in mind)

- Views of garden
- South facing courtyard
- Relationship to street scene
- Local materials
- **Glazing design, materials specification, construction junctions**

Model in PHPP

Test assumptions and confirm compromises work



Passivhaus Plus standard

What the standard asks of a home

≤ 15

kWh/m² per year

Space heating demand

≤ 0.6

air changes per hour @ 50Pa

Airtightness

≤ 45

kWh/m² per year

Primary energy renewable (PER)

≥ 60

kWh/m² per year

Renewable generation, per m² of footprint

Copper Beech is built to the Passivhaus Plus standard. Figures show the standard's criteria, not measured results for the project.

Specification

Five elements working together

Insulated raft foundation

300mm Kore EPS insulation with Compacfoam thermal breaks

Prefabricated timber frame

MBC Timber Frame 350mm twin stud timber frame, with Smartply boards and Partel membranes

Recycled newspaper insulation

Isofloc blown cellulose insulation, recycled material with low manufacturing energy

Triple glazing

High quality triple-glazed windows by 21 Degrees.

MVHR ventilation

Zehnder ComfoAir Q600 by 21 Degrees

Exceptional insulation and airtightness create a healthy, comfortable home for generations to come.

Enabling Works

1

Pre-demolition & site assessment

1. Hazardous Material Survey
2. Geotechnical Investigation
3. Utility Plans

2

Demolition

1. Demolition of a 1930’s detached house
2. Foundation removal
3. Separate usable materials

3

Embodied carbon offsetting

1. Existing bricks reclaimed
2. Roof slate reclaimed
3. Cutting hauling fuel, avoiding landfill waste and eliminating new brick manufacturing emissions





Slab Details

1

Slab preparation

Foundation engineer’s specification

2

Slab detail

300mm EPS insulation with external brickwork footing

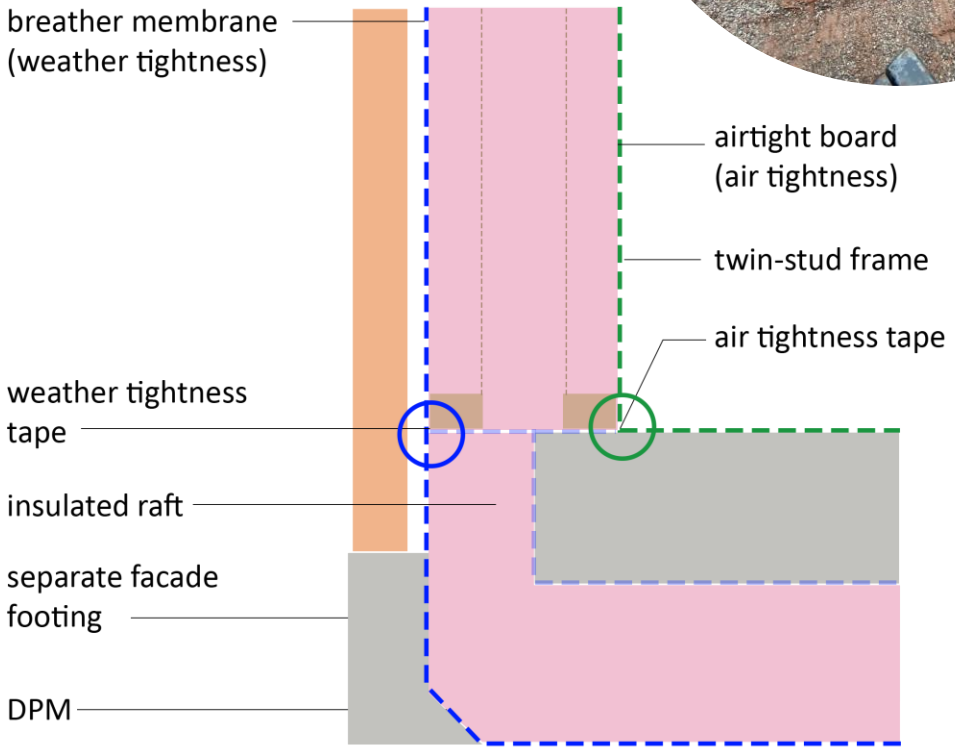
Underfloor heating with a power floated slab finish

3

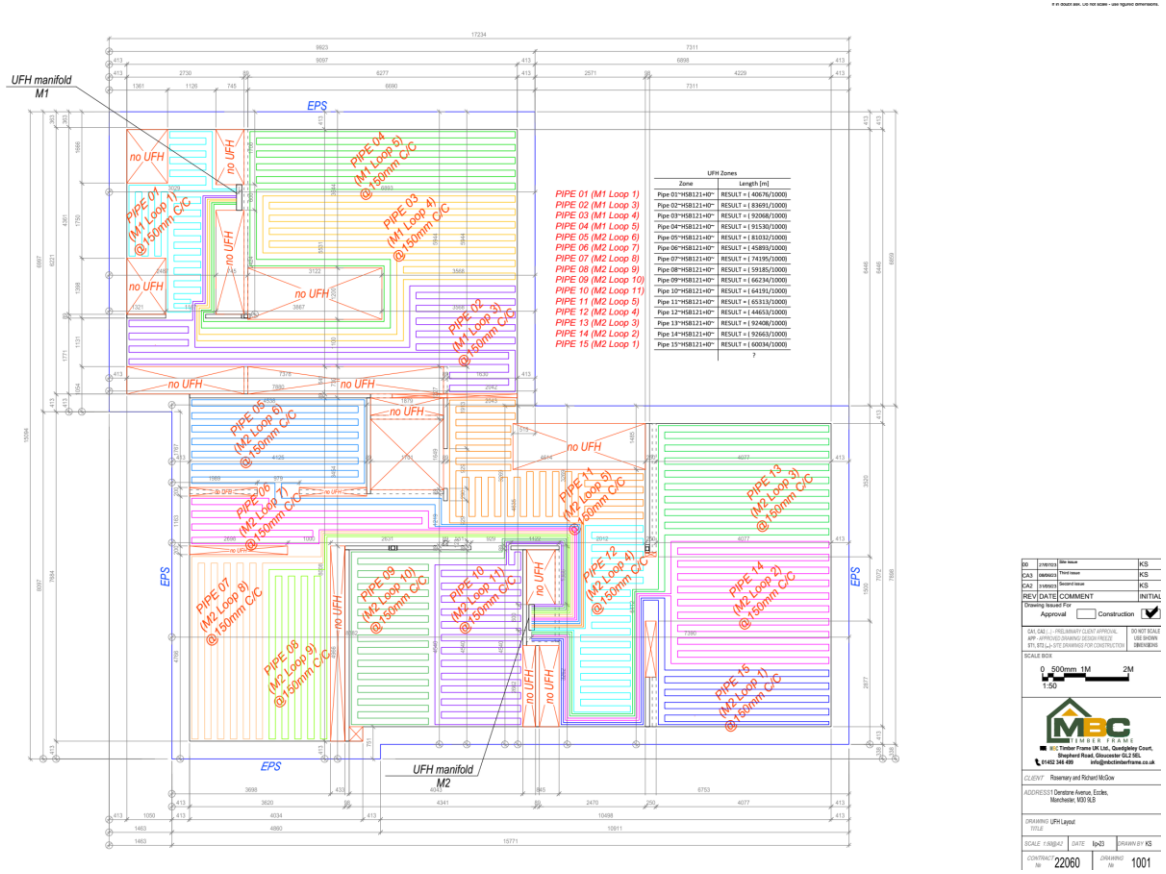
Insulated raft benefits

1. Eliminates cold bridges
2. 60% less concrete
3. Quicker and more cost effective than conventional strip foundations





Slab Build


UFH manifold
M1
EPS
no UFH
PIPE 01 (M1 Loop 1) @150mm C/C
PIPE 04 (M1 Loop 6) @150mm C/C
PIPE 03 (M1 Loop 4) @150mm C/C
PIPE 02 (M1 Loop 3) @150mm C/C
PIPE 05 (M2 Loop 6) @150mm C/C
PIPE 06 (M2 Loop 7) @150mm C/C
PIPE 07 (M2 Loop 8) @150mm C/C
PIPE 08 (M2 Loop 9) @150mm C/C
PIPE 09 (M2 Loop 10) @150mm C/C
PIPE 10 (M2 Loop 11) @150mm C/C
PIPE 11 (M2 Loop 5) @150mm C/C
PIPE 12 (M2 Loop 4) @150mm C/C
PIPE 13 (M2 Loop 3) @150mm C/C
PIPE 14 (M2 Loop 2) @150mm C/C
PIPE 15 (M2 Loop 1) @150mm C/C
UFH manifold
M2
UFH Zones
Zone
Length [m]


TREE PROTECTED
DO NOT MOVE FENCING

Timber Frame Details

1

Working together to reduce TBs

MBC Timber Frame have standard details to achieve a good u-value, but there are variants and these need to be accommodated in PHPP

2

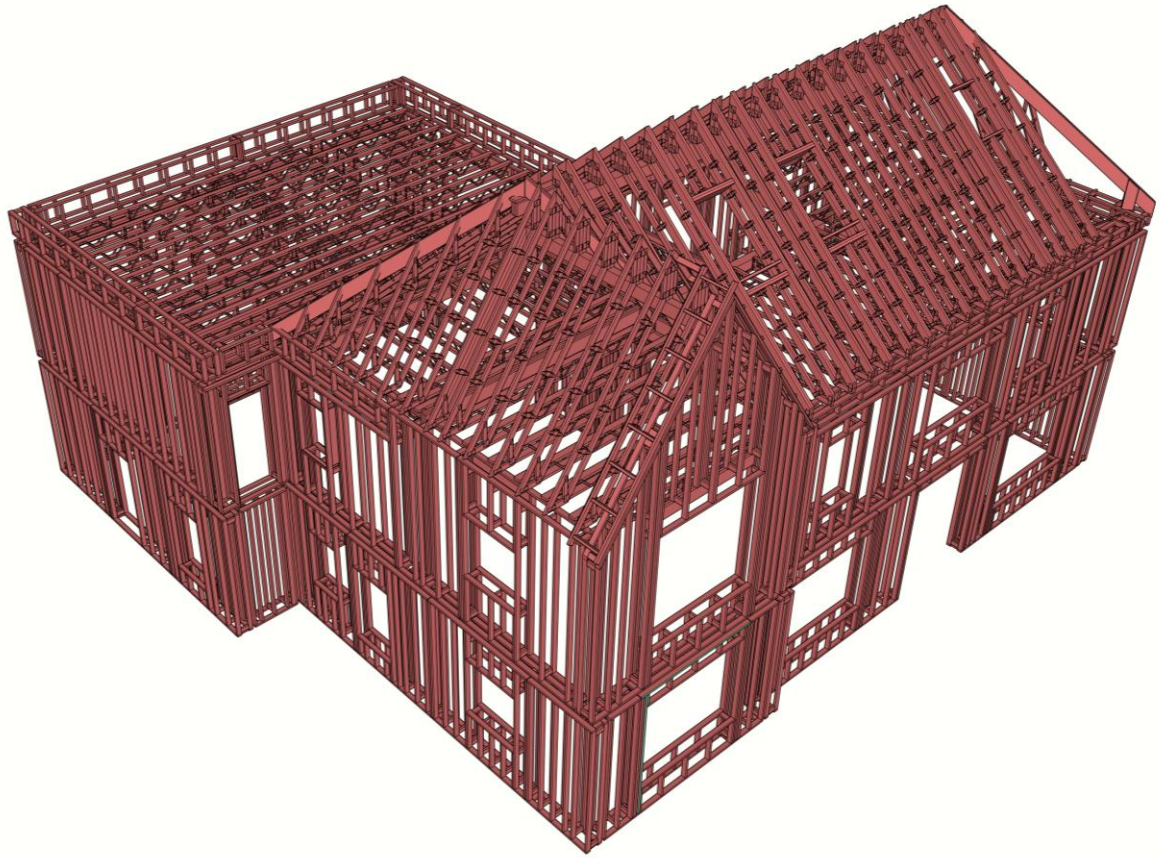
Timber Fraction

Calculating the exact % of timber to insulation within the wall and roof cassettes

3

Access

Can we get the trucks in and is there space for the right crane and base



Timber Frame Build

1

2 week programme

Timber frame was constructed in just 2 weeks

2

Twin stud construction

Method used to build double stud walls for exceptional thermal insulation

3

Air tightness details

Membranes installed ready to make intersecting levels and junctions airtight





Airtightness Details

1

Airtightness Strategy

Smartply walls, membranes to roof, airtight slab

2

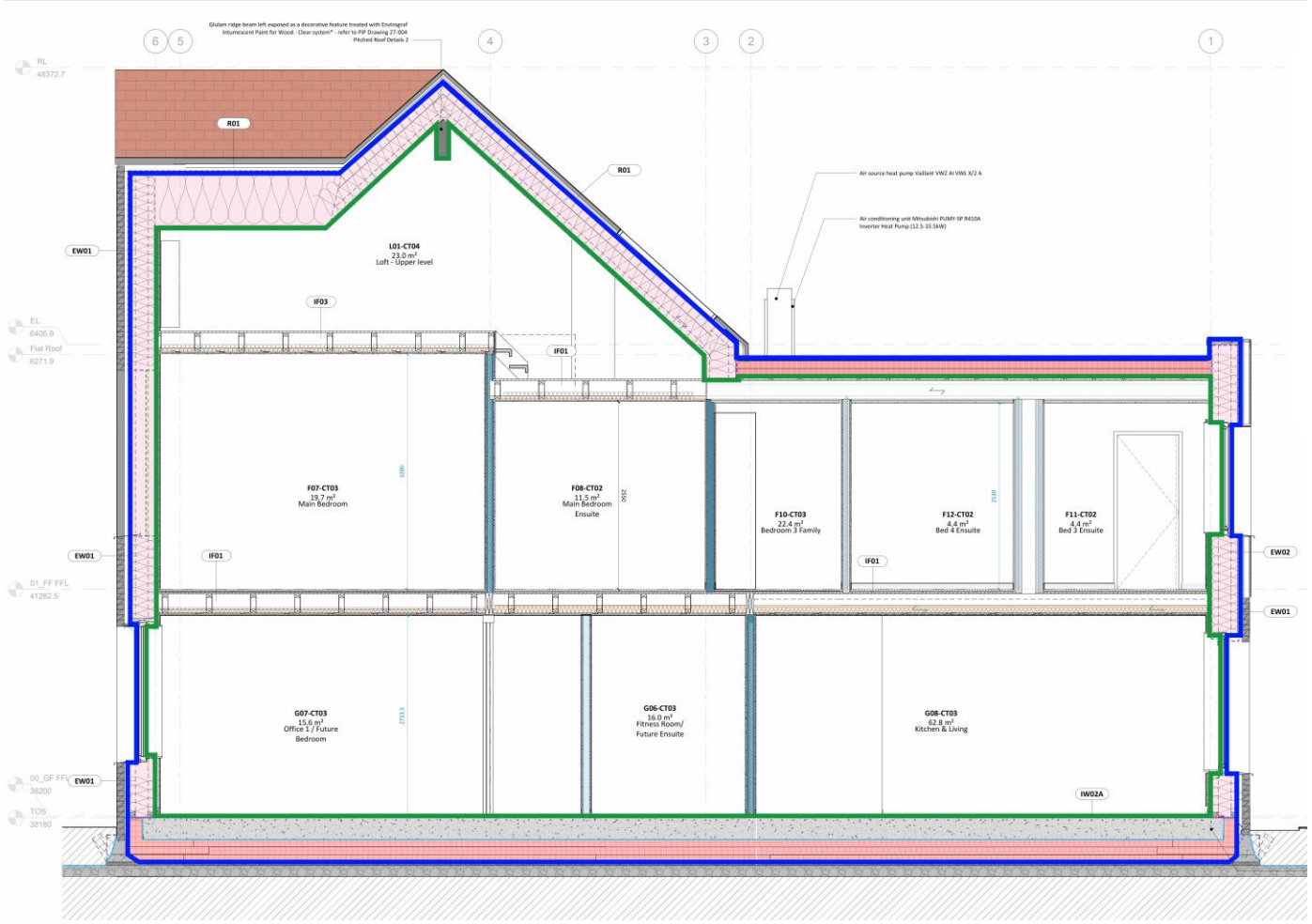
Windows

High quality products with good seals and taped in place

3

Penetrations

Ducts, pipes and cables



Airtightness Build

1

Pre-fabricated timber frame

Off site manufacturing in a controlled factory
pretty much guarantees air tightness!

2

Penetrations

All penetrations have to be sealed using airtigh tape or cable grommets

3

Pressure test result

0.41 ACH







DESIGN AIR PERMEABILITY:		0.6 ACH (Passivhaus)
TEST RESULT:	(Average of below)	**0.41 ACH@50pa**
	Depressurisation	0.41 ACH@50pa
	Pressurisation	0.41 ACH@50pa

Finishes

1

Sliding shutters & brise soleil

Prevent summertime overheating

2

Integrated gutters and rainwater pipes

Creates a seamless finish

3

Materials – Herringbone, lime mortar charred timber, cedar porch/brise soleil

Showcasing timber frame Passivhaus builds can look exciting



Finishes

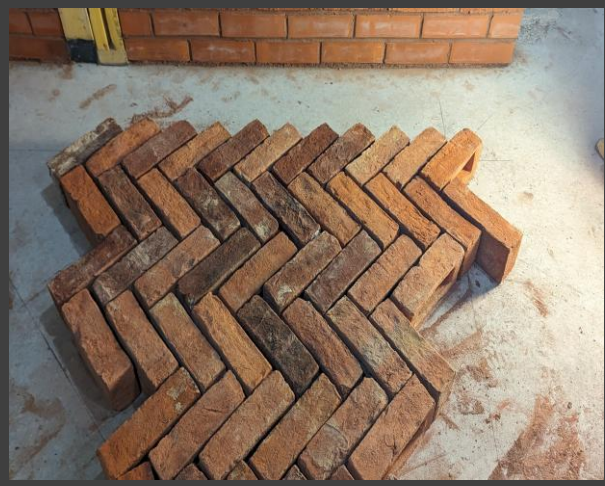
Progress in Practice & Bailey Projects

Copper Beech Passivhaus Plus,

Net Zero Energy











Renewables

1

Solar PV

40 x Trina Vertex 415w panels with 2 x SolarEdge E-Series 10.0kw batteries and SolarEdge car charger

2

5kW Air source heat pump

1 x 5kW Vaillant ASHP. Provides sufficient heating and hot water to this 384m2 property over 3 floors

3

Mechanical ventilation and heat recovery

Full MVHR system using the Zehnder ComfoAir Q600







Collaboration

1

Working as a team

Whole team – Contractor/Architect/Client

Full team and sub-contractors understood the brief from their first day on site

2

Problem solving together

Open and honest discussions and blame free culture

3

Second Passivhaus

Delivered a second Passivhaus project, Silver Wings, with Progress in Practice



Performance

How Copper Beech actually performs

≤ 12.8

kWh/m² per year

Space heating demand

≤ 0.4

air changes per hour @ 50Pa

Airtightness

≤ 36

kWh/m² per year

Primary energy renewable (PER) Demand

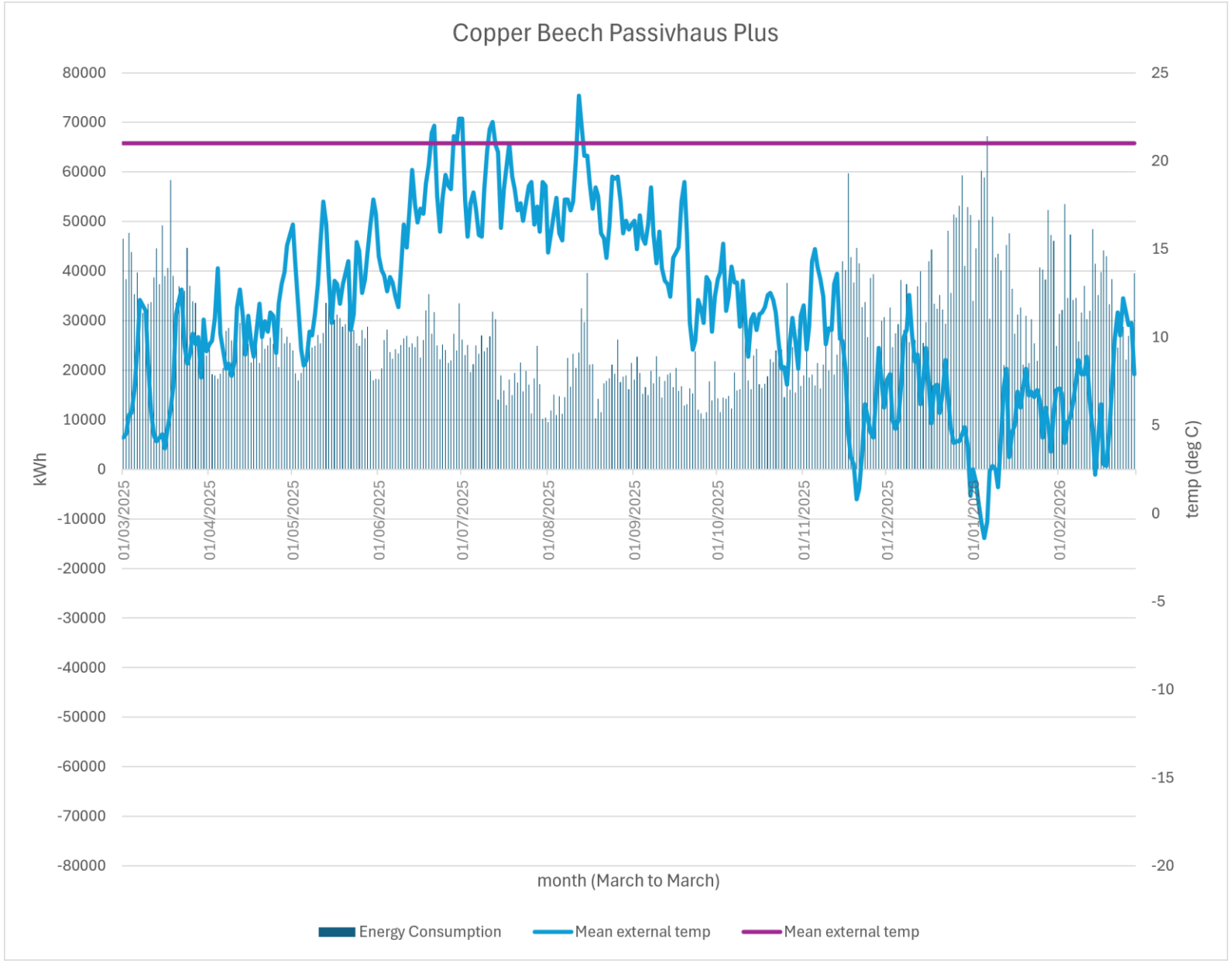
≥ 44

kWh/m² per year

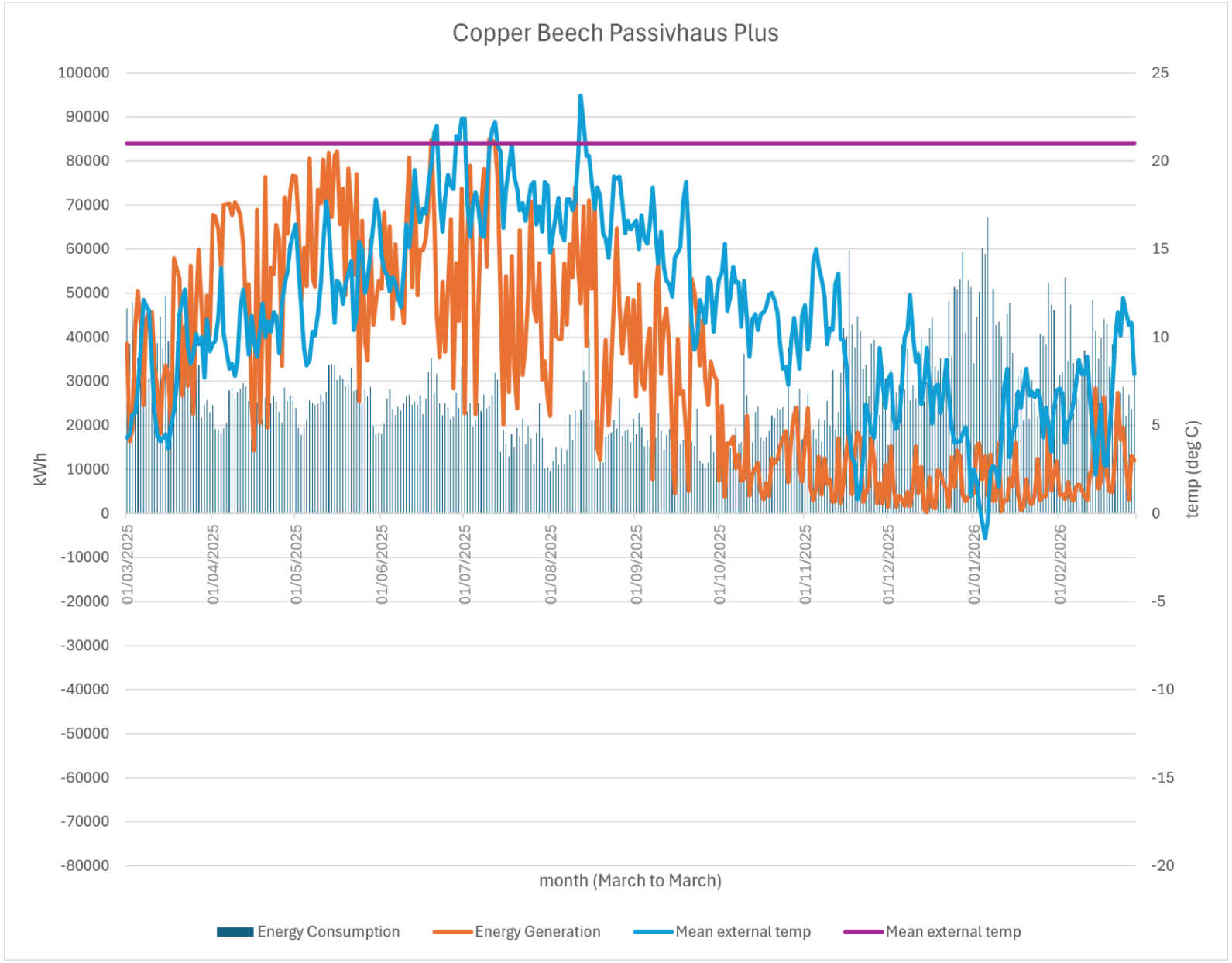
Renewable generation, per m² of footprint

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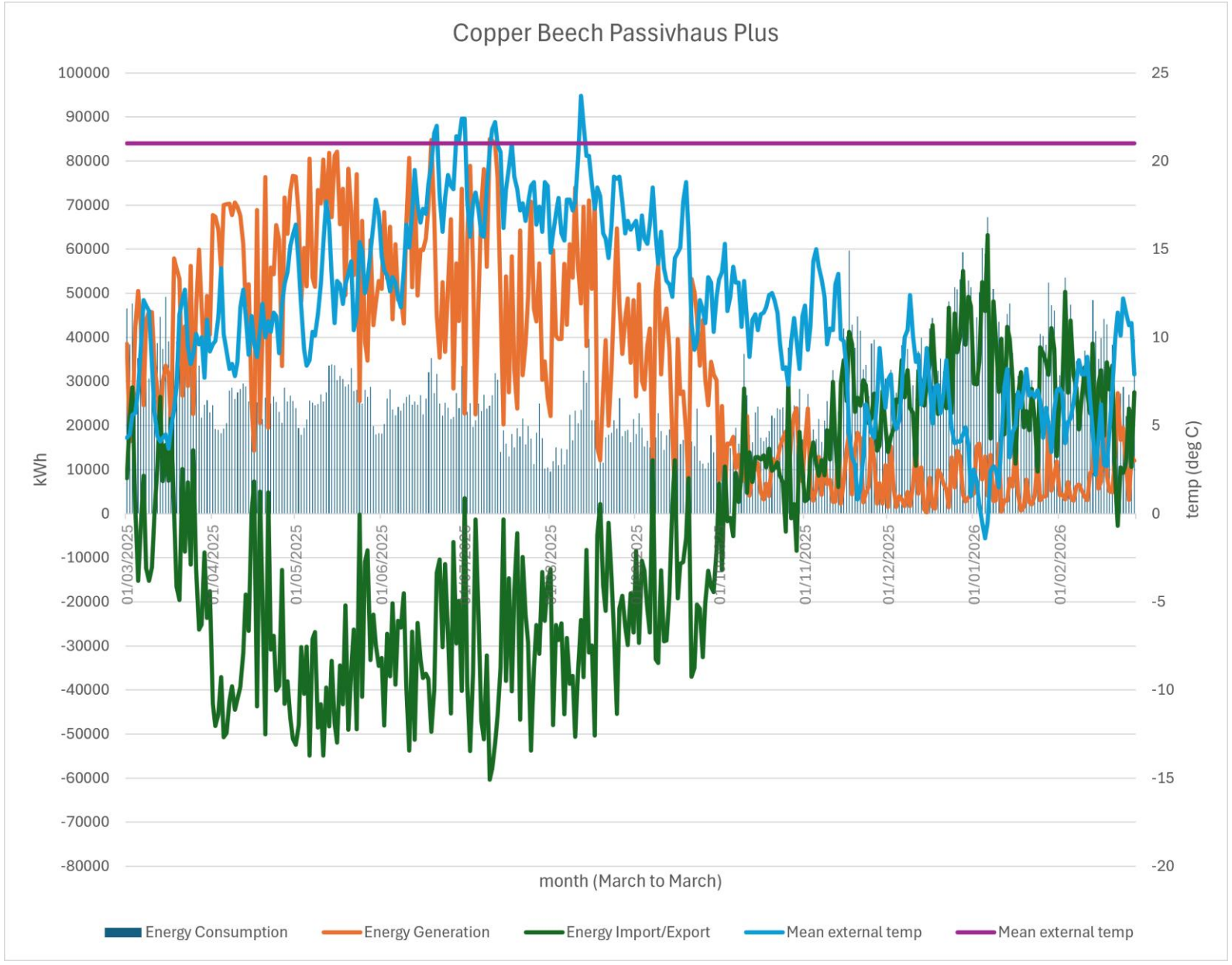
Performance



Performance



Performance



Performance

	Solar Production				Domestic Consumption			
Month	Production To Battery (kWh)	Production To Grid (kWh)	Production To Home (kWh)	Total Production (kWh)	Consumption From Battery (kWh)	Consumption From Grid (kWh)	Consumption From Solar (kWh)	Total Consumption (kWh)
2025								
Mar	489.81	263.73	431.54	1,185.08	481.48	232.83	431.54	1,145.85
Apr	334.69	965.98	422.13	1,722.80	304.13	13.19	422.13	739.45
May	348.30	1,102.18	480.14	1,930.63	316.37	15.44	480.14	811.96
Jun	293.23	937.20	472.38	1,702.81	279.76	14.22	472.38	766.36
Jul	245.72	953.70	381.45	1,580.87	234.07	10.92	381.45	626.43
Aug	229.18	839.56	345.24	1,413.97	228.95	13.60	345.24	587.78
Sep	270.80	498.79	237.91	1,007.50	251.42	16.99	237.91	506.32
Oct	208.46	13.80	151.51	373.77	245.66	219.50	151.51	616.66
Nov	143.25	5.79	133.32	282.36	152.52	605.30	133.32	891.14
Dec	78.11	4.49	98.75	181.36	82.58	957.63	98.75	1,138.95
2026								
Jan	105.24	3.83	115.87	224.94	117.71	972.21	115.87	1,205.79
Feb	132.52	12.88	126.01	271.41	175.75	660.42	126.01	962.17
Grand Total	2,879.31	5,601.95	3,396.25	11,877.51	2,870.39	3,732.24	3,396.25	9,998.88

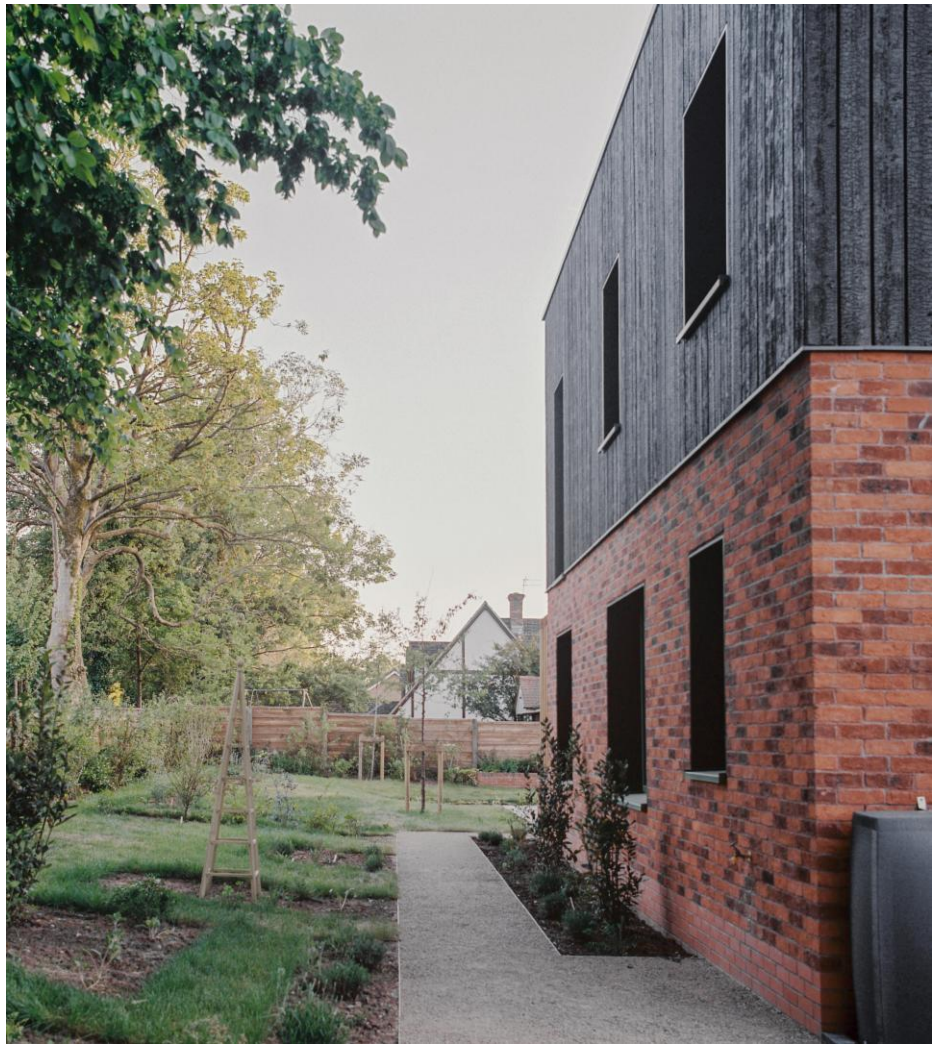
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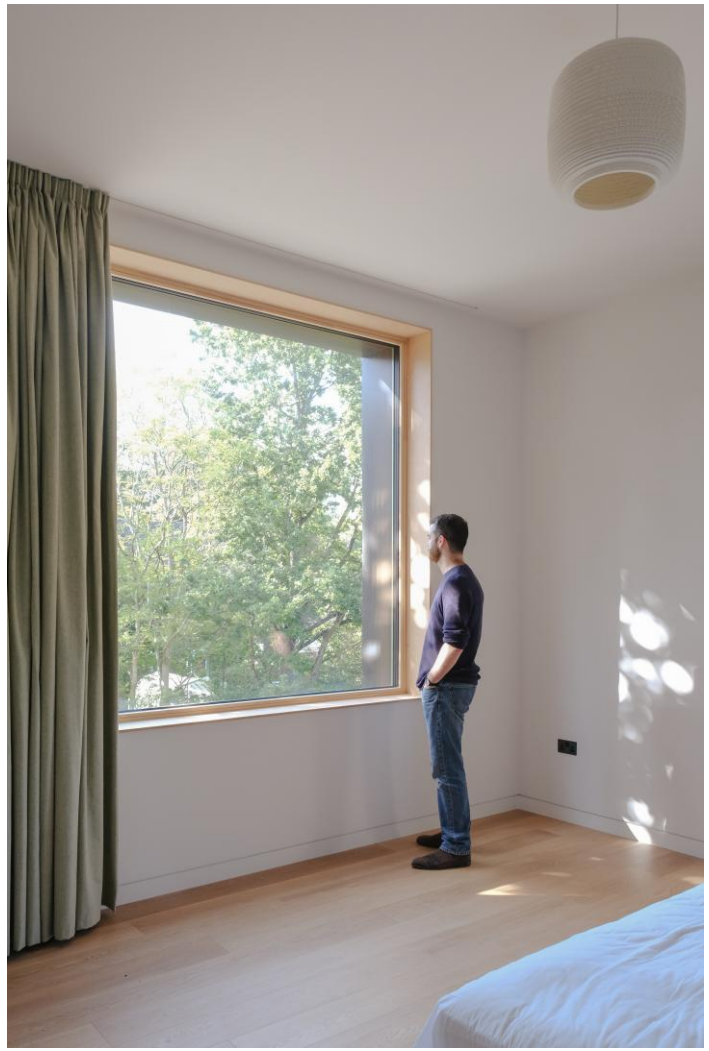


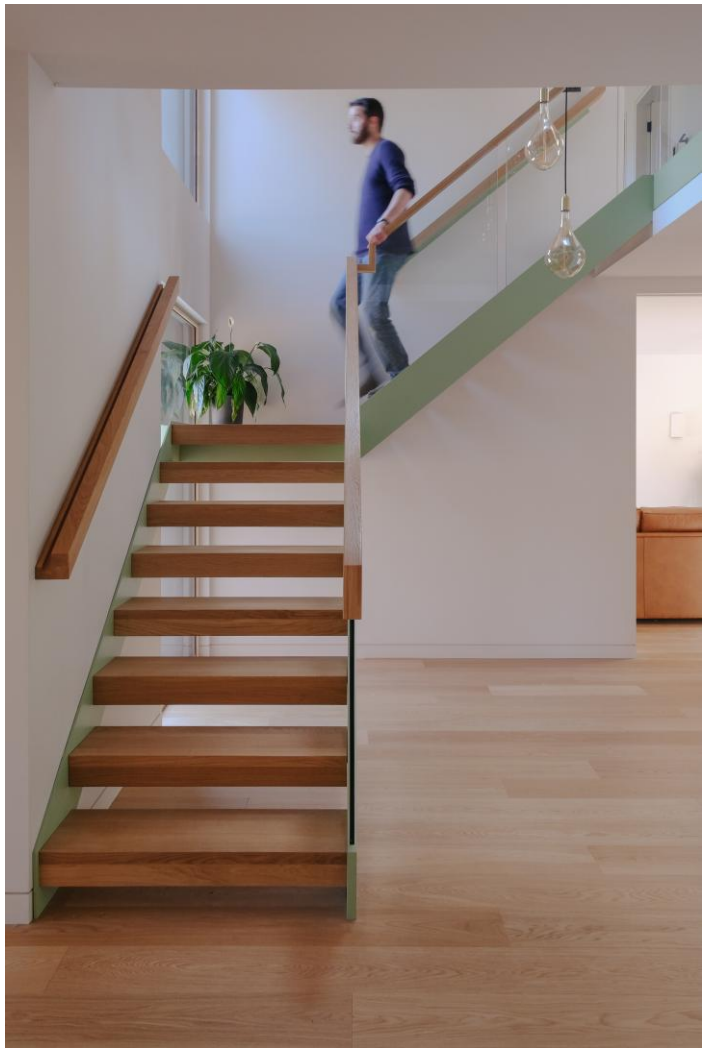


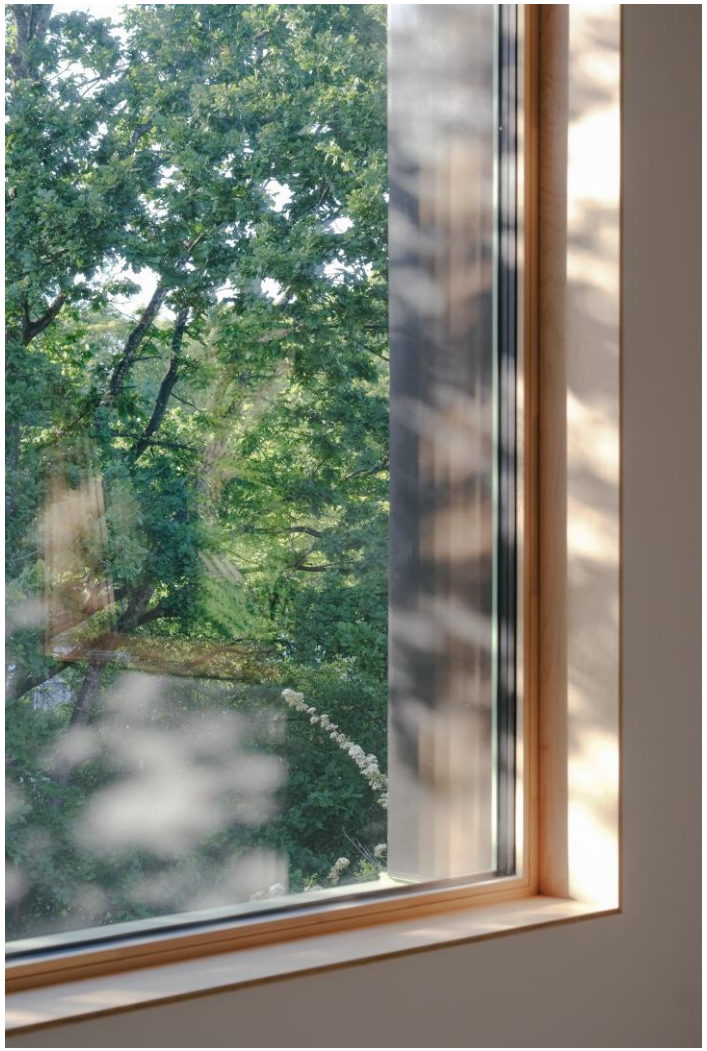






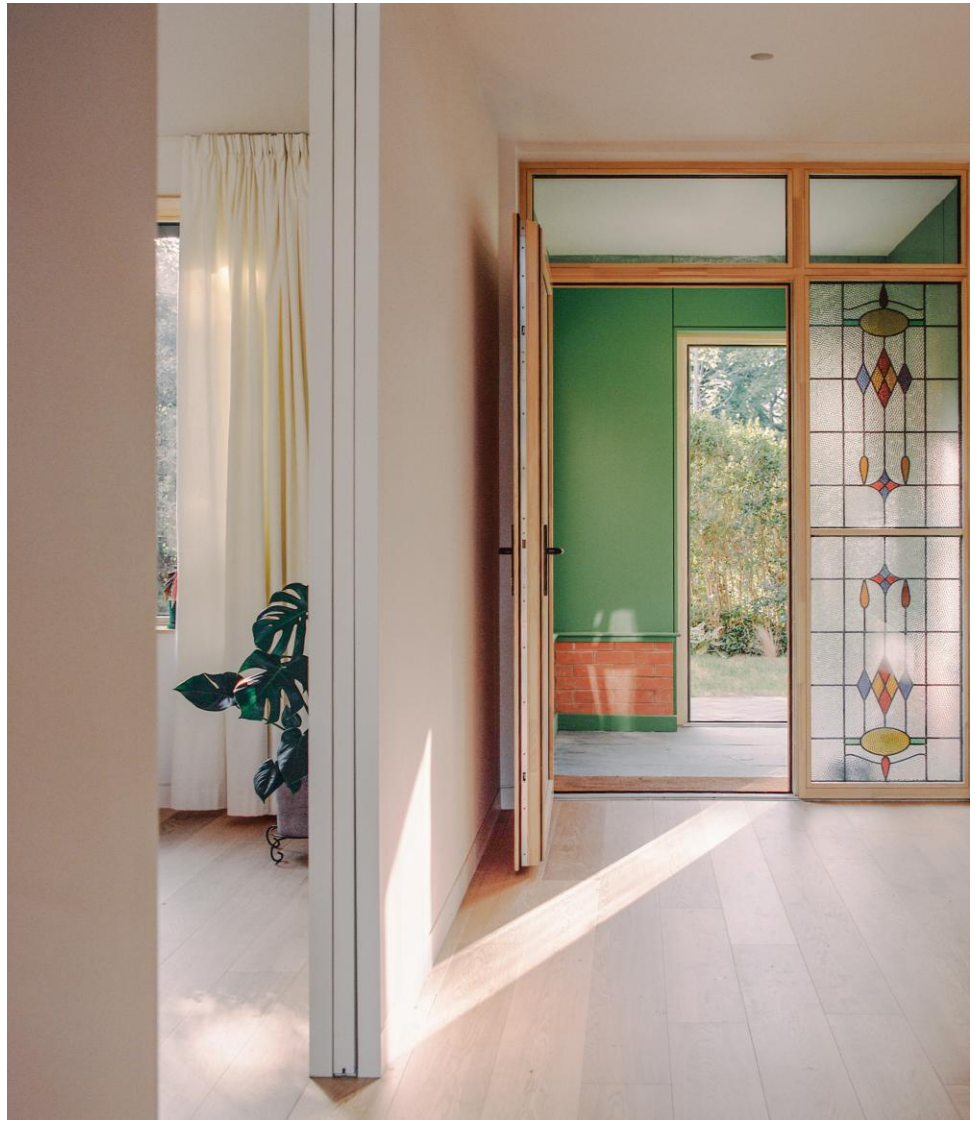






“The benefits of Passivhaus in terms of comfort and economy are simply gobsmacking. I felt the need to write to Octopus after several minus £2 bills to explain that these were not fraudulent but the result of superbly designed and constructed insulation. The constantly stable internal environment is just a joy to live in – a near miracle compared to the freezing, drafty winters and sweaty summers in our previous conventional build.”

John, Copper Beech client



Thank you

Copper Beech
Passivhaus Plus, Net Zero Energy

Hannah Dixon

Director, Progress in Practice

Sam Bailey

Director, Bailey Projects

